REMARKS

In the Office Action, the Examiner rejected claims 1-35 under 35 USC 102, 103, and 112. These rejections are fully traversed below.

Amendments have been made to the drawings and specification to correct minor informalities and typographical errors. Claims 1, 2, 4, 5, 8, 10, 12, 14, 20, 21, 24, 25, 30, 31, 32 have been also been amended to correct minor informalities and typographical errors. Claim 1 has been further amended to include the limitations of claims 9 and 13, claim 20 has been further amended to include the limitations of claim 28 and claim 35 has been further amended to include the limitations of claim 31. No new material was added to these claims. Claims 36-47 have been added. Claims 9, 13, 28 and 35 have been cancelled. Thus, claims 1-8, 10-12, 14-27, 29-34, and 36-47 are pending in the application. Reconsideration of the application is respectfully requested based on the following remarks.

It should be noted that the amendments and cancellations have been made to expedite the prosecution of this case and therefore the Applicant reserves the right to go after the original claims in a continuing application.

Drawings

It is believed that the objections have been overcome by the amendments made above (see Amendments to Drawings and Amendments to Specification).

Specification

It is believed that the objections have been overcome by the amendments made above (see Amendments to Specification).

Claim Objections

It is believed that the objection has been overcome by the amendment made above (see Listing of Claims).

Claim Rejections – 35 USC 112

It is believed that the objections have been overcome by the amendments made above (see Listing of Claims).

Claim Rejections – 35 USC 102

Claims 1-4, 7, 9, 11, 12, 15-20, 23, 26 and 27 have been rejected under 35 U.S.C. 102(e) as being anticipated by *Bareket* (US 6,462,818).

The rejections are moot based on the amendment above. Particularly, claims 9 and 13 were moved into claim 1, and claim 28 was moved into claim 20.

Claims 31-33 have been rejected under 35 U.S.C. 102(b) as being anticipated by *Bareket* (EP 0818814).

The rejections are moot based on the amendment above. Particularly, claim 35 was moved into claim 20.

Claim Rejections – 35 USC 103

The present invention is directed at overlay marks, which are used to determine the alignment of separately generated patterns on a substrate. The patterns are either on successive layers of the substrate or they are in the same layer. As stated in the specification of the present invention, "The present invention, in each of the various embodiments, uses overlay marks that are composed of periodic structures formed on each of two layers of a semiconductor wafer to provide overlay information between those two layers of the semiconductor device. The overlay marks are formed in specific locations on each wafer layer such that the periodic structures on one layer will be aligned with the periodic structures on the other layer when the two layers are properly aligned. Conversely, the periodic structures on each layer will be offset from each other when the two layers are not properly aligned. Alternatively, the present invention may use overlay marks that are composed of periodic structures formed on a single layer by two or more separate processes to provide alignment information between two different patterns on the same layer (Page 9, lines 12-22)."

In contrast to the above, some of the cited references particularly *Kaiser* and *Dirksen*, are directed at alignment marks. *Kaiser* states, "The invention relates to alignment patterns or marks to be used to align two objects to one another...Such alignment marks are particularly used in semiconductor technology and more particularly for relative alignment of a wafer and mask in photolithography (Col. 1, lines 5-13)." *Dirksen* states in claim 1, "...detecting said image by means of an alignment device for aligning an alignment mark of a mask with respect to an alignment mark of a substrate (Col. 26, lines 65-67)."

While alignment marks and overlay marks may appear to be similar to Examiner, it should be emphasized that there are fundamental differences between overlay marks and alignment marks (which makes there use in the rejections improper). Alignment marks in particular are used to align a mask or reticle to a wafer. This is typically accomplished by moving the mask and wafer relative to one another until an alignment feature located on the mask is aligned with the alignment mark located on the wafer. Once they are aligned, patterning can commence on the wafer using the mask. The alignment marks are not subsequently used to determine how well two patterns are aligned. This has always been accomplished using overlay marks particularly box in box structures as discussed in the background of the present invention. In fact, no portion of the alignment mark is compared to another portion or to another alignment mark to determine alignment of two patterns on the wafer. Alignment marks are only compared to alignment features on masks or reticles. Because of this, one skilled in the art would simply not look to these references to solve problems and make improvements associated with overlay measurements. Alignment marks are simply not overlay marks and therefore the rejections are improper and should be withdrawn.

It should be noted that *Dirksen* also discloses test marks capable of measuring the settings of apparatus and the quality of the projection lens system. These too suffer from the same drawbacks as the alignment marks as they do not compare patterns of the wafer to determine overlay. Furthermore, they are configured to operate similarly to alignment marks such that they are detected by alignment devices (see Col. 16, lines 33-53).

Claim 34 has been rejected under 35 U.S.C. 103(a) as being unpatentable over *Bareket* (EP 0818814).

The rejection is moot based on the amendment above. Particularly, claim 35 was moved into claim 20.

Claims 1, 5, 6, 8, 10, 20-22, 24 and 25 have been rejected under 35 U.S.C. 103(a) as being unpatentable over *Kaiser* (5,172,190) in view of *Bareket* (EP).

The rejections are moot based on the amendment above. Particularly, claims 9 and 13 were moved into claim 1, and claim 28 was moved into claim 20.

Claim 35 has been rejected under 35 U.S.C. 103(a) as being unpatentable over *Bareket* (EP) as applied to claim 31 and further in view of *Dirksen* et al (5,674,650).

Claim 35 has been moved into claim 31.

A prima facie case of obviousness has not been made. While *Bareket* may disclose overlay techniques, *Dirksen* does not. *Dirksen* discloses alignment marks and as discussed above these operate under very different principals. Alignment marks are used to ensure that a mask is aligned to a wafer, they are not used for measuring alignment, and more particularly for measuring the alignment between two separated generated patterns of a wafer. One skilled in the art simply would not be motivated to combine the two teachings. This is especially true since *Dirksen* provides no incentive or motivation for merging his invention with overlay. The fact that these technologies are related to alignment is not enough. Nowhere in the cited references is it suggested that alignment can be applied to overlay. As such, the rejection is improper and should be withdrawn.

Even if one were to apply the techniques described in *Dirksen* to overlay, they would apply them to the conventional approach which is box-in-box, not to the new novel approach, which uses periodic structures, and more particularly periodic structures arranged in a new novel manner as disclosed in the present invention.

Claim 30 has been rejected under 35 U.S.C. 103(a) as being unpatentable over *Cresswell* et al (5,617,340) in view of *Dirksen*.

This rejection suffers from the same problems as above. Particularly, *Dirksen* has been improperly combined with *Cresswall*. *Cresswall* appears to be directed at overlay between layers while *Dirksen* is directed at alignment between mask and wafer. As such, the rejection is improper and should be withdrawn.

Furthermore, it should be pointed out that *Cresswall* is directed at "box in box" and "bar in bar" style overlay marks (see background of present invention for description of these overlay marks). *Cresswall* states, "parallel portions of taps 22 and 28 comprise a portion of conventional "bars-in-bars" overlay test pattern, as indicated at 32 (Co. 9, lines 37-39)." *Cresswall* further states, "Accordingly, if an imaging-instrument measurement (providing a conventional "bars-in-bars" or "frame-in-frame" measurement") is made of the relation of reference marks 76 with respect to reference members 72...(Col. 14, lines 32-34)." And this style of overlay marks simply does not relate to the marks in the present invention, which are trying to solve problems associated therewith. Particularly, improving the correlation between the overlay error measured on the test pattern and the real overlay error of the circuit components. In order to do this, the overlay marks of the present invention are composed of periodic structures formed on two or more successive layers of a substrate or between two or more separately generated patterns on a single layer of a substrate. The periodic structures increase the amount of information that may be used to measure overlay, and which may be modified to diminish the impact of certain processes on overlay measurements. For further improvements, each of the structures (e.g., lines) in the periodic structure, are further composed of substructures that are sized closer to the size of actual circuits. Using substructures, a more accurate measurement of any alignment error in the circuits can be obtained since the substructures perform (patterned) similarly to the circuit devices themselves. *Cresswall* simply does not teach periodic structures, and further he does not teach or suggest substructures and therefore the rejection should be withdrawn.

Claims 13, 14, 28 and 29 have been rejected under 35 U.S.C. 103(a) as being unpatentable over *Kaiser* in view of *Bareket* (EP) as applied to claims 1 and 20, and further in view of *Dirksen*.

The rejection should be withdrawn for the same reasons as stated above with regards to *Baraket* and *Dirksen*. Like *Dirksen*, *Kaiser* is directed at alignment marks not overlay marks and thus the rejection is improper and should be withdrawn.

SUMMARY

Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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